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The fate of atmospherically-deposited mercury in high elevation ecosystems in the Rocky Mountains.

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Annual wetfall deposition of mercury in the mountains of Colorado is 6-10 $\mu\text{g}/\text{m}^2$, which is comparable to parts of the Midwestern and Eastern United States where fish consumption advisories are widespread. Here we examine the fate of that mercury and its impact on high-elevation ecosystems in Rocky Mountain National Park (RMNP).

Concentrations of total mercury in headwater streams in Loch Vale, RMNP, averaged 1-4 ng/L during spring and summer of 2001-2003. Most of the mercury was dissolved rather than particulate in these clear mountain streams, unlike many other stream environments where mercury has been studied extensively. Mercury concentrations peaked along with dissolved organic carbon (DOC) as soils were flushed during early snowmelt and rainy summer periods. Export of mercury was as high as 20% of atmospheric deposition, contributing substantially to mercury loading in downstream lakes and reservoirs. Methyl mercury concentrations measured in the headwater streams were generally near or less than 0.04 ng/L during summer. However, concentrations of methyl mercury in excess of 0.5 ng/L were measured in the hypolimnion of snow-covered lakes, indicating that under-ice conditions may be important in controlling methylmercury formation and subsequent bioaccumulation, especially in lakes and ponds where oxygen is depleted. During a synoptic survey in August 2003, streamwater concentrations of total mercury decreased from 1.8 ng/L in alpine headwaters to 1.2 ng/L in subalpine waters 3km downstream, and were strongly related to DOC concentrations. Concentrations of total and methyl mercury were greater in ground water than in surface water— shallow ground water in one wetland had a methyl mercury concentration of 0.9 ng/L. Concentrations of mercury in brook, rainbow, and cutthroat trout (175-340mm in length) collected from eight alpine lakes in Rocky Mountain National Park had mercury concentrations that ranged from <0.003 to 0.151 ppm wet weight; greater levels of mercury are expected in large brown trout that occupy rivers downstream. Current and future investigations will focus on mercury cycling processes and controls on exposure of aquatic organisms to mercury in mountain environments of the Western United States.